Our Watery World

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Some watery facts

Our planet is often called ‘the blue planet’.
You can see that from outer space it does look blue.

Why? It’s because almost three quarters of the Earth’s surface is covered in water. About 95 percent of that is salt water and the rest is fresh water.

Freshwater facts:

- About 70 percent of the Earth’s fresh water is frozen in glaciers and ice caps.
- Less than 1 percent of the Earth’s fresh water is able to be accessed.
- A small percentage of water is vapour in the atmosphere.
- There is more fresh water stored under the ground than there is flowing on the surface.

Map the oceans and seas

There is actually just one ocean, but the parts between continents have different names.

What is a sea? They are smaller than an ocean and are usually where ocean and land meet. So seas are partially enclosed by land.

To see the names of oceans and seas, go online to
https://www.dkfindout.com/us/earth/oceans-and-seas/

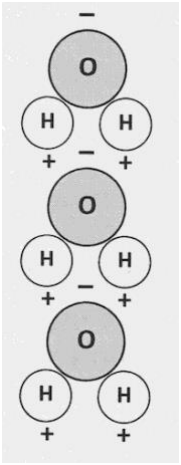
Use the blank map of the world on page 18, and label the oceans, seas and continents.

What is water?

All living and non-living things are made up of molecules, and there are more water molecules than any other sort. Molecules are made up of even tinier parts called atoms.

One molecule of water is made of two atoms of hydrogen, which is written as H_2 and one atom of oxygen, which is written as O.
So the short way of writing water's chemical name is H_2O.

The + hydrogens of one water molecule are attracted to the - oxygen of another water molecule. This is called **cohesion**, and it is why water makes clumps called water drops. Because of gravity, water drops are pointy at the top end.



Density measures how many molecules are in an amount of water.

- Saltwater is more dense than freshwater.
- Cold water is more dense than warm water.

In other materials, solids are heavier than liquids. However, water is different. Its solid form – ice – is less dense than liquid water, so it floats. This is because when water freezes, it expands and the molecules are less tightly packed.

More materials dissolve in water than in any other liquid.

Wherever water flows, it picks up and carries chemicals, minerals and nutrients whether it is flowing on the ground, under the ground or through our bodies.

The Water Cycle

We see water as:

- **Vapour** (or gas), as steam or clouds. Invisible water vapour in the air is called humidity.
- **Liquid**, flowing from a tap or in a lake, river or ocean.
- **Solid**, frozen as ice. Snowflakes are made of ice crystals.

When it rains the drops of water falling on you may actually have fallen on dinosaurs! There is a limited amount of water on Earth that keeps going round and round in a cycle. The Water Cycle in fact.

The parts of the water cycle are:

Evaporation

This happens when a liquid changes to a gas. The sun warms the water in rivers, lakes or the ocean and turns it into vapour or steam. The water vapour or steam leaves the river, lake or ocean and goes into the air.

Evaporation also occurs throught the leaves of plants: water from the soil moves through the plant roots and stem and into the leaves where some of it evaporates, adding to the water vapour in the air. This kind of evaporation is called **transpiration**.

Condensation

This occurs when a gas is changed into a liquid. When the moist warm air meets cold air, the warm air is forced over the heavier cold air. The moisture condenses and forms clouds made up of water droplets.

Precipitation

This happens when more and more moisture condenses into clouds. The small droplets of water join and become larger and heavier. Eventually the water drops can’t be held in the air any longer and fall to the earth as rain, hail, sleet or snow.

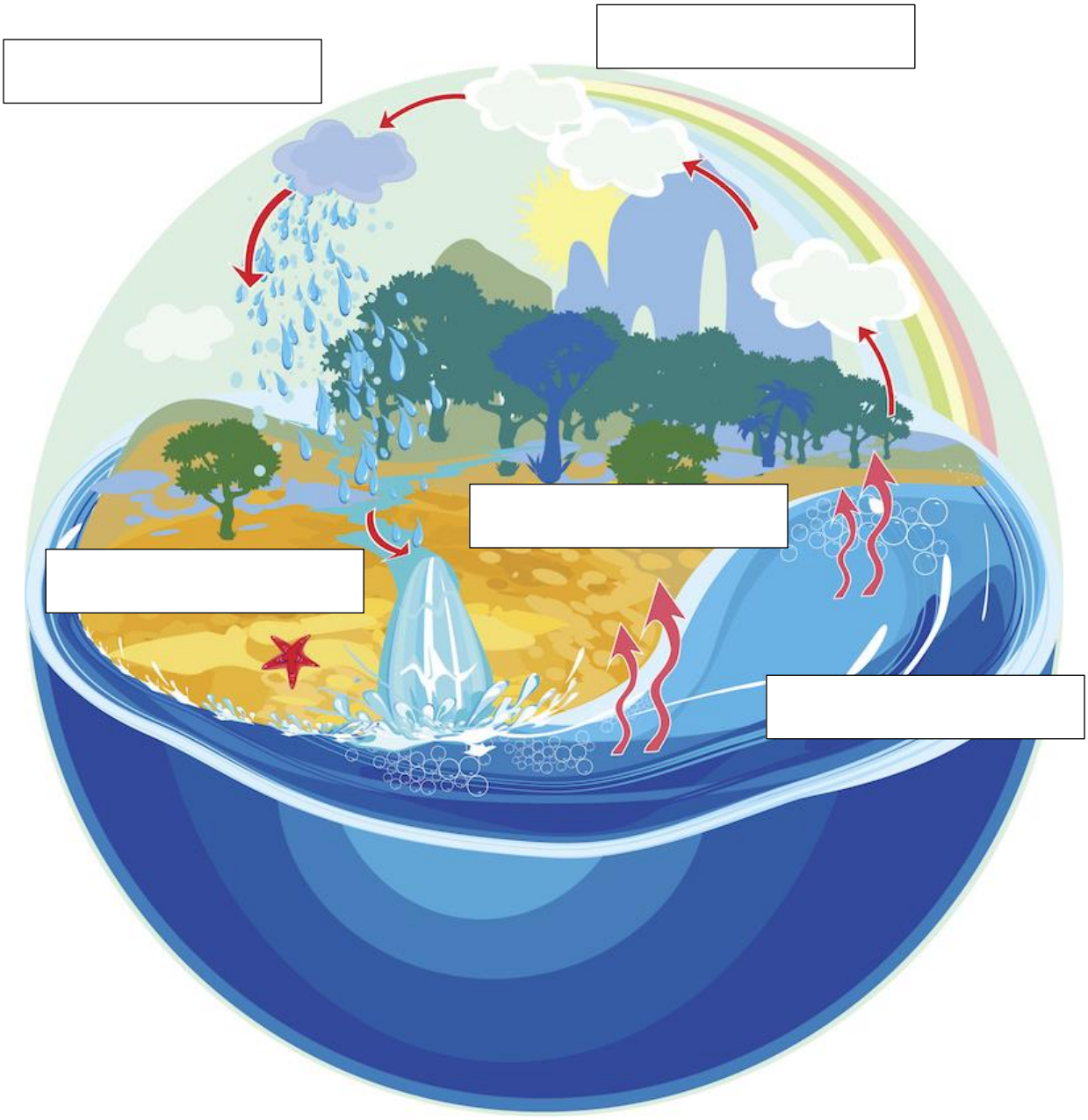
Runoff and collection

Rain falls into oceans, lakes, rivers and onto land. When it falls on land it will either soak into the earth and become part of the groundwater that feeds animals and plants, or it runs off the surface and flows downhill into streams, rivers, ponds and lakes, where the cycle begins again.

Label a water cycle diagram

Write labels in the boxes to show the water cycle in action. Draw extra arrows if you wish.

The Water Cycle



Why the sea is salty

If the seas receive fresh water from rain and from the rivers flowing into them, how come the seas and oceans have salty water?

Go online to **https://www.kidcyber.com.au/oceans** to find out.
You can also use a search engine to find out more information. Type in 'why the sea is salty' and choose from the websites that come up.

Make a book, or chart or Power Point presentation about why the sea is salty.

What makes the waves form

Go online to these websites to find out.

https://www.ducksters.com/science/earth_science/ocean_waves_and_currents.php

https://www.youtube.com/watch?v=_LRc6k-clzE

Make a list of ways in which humans use the ocean

Demonstrate the Water Cycle

You need:

- A zip lock plastic bag, sandwich size.
- Measuring spoon
- Masking tape

Pour 2 teaspoons of water into the plastic bag and seal it.
Tape the bag onto a window in a sunny spot.
Look at the bag throughout the day.
Record the changes you see.

Make a series of labelled drawings showing the changes you observed.
You can do that here or on a sheet of art paper.

Observations

Observing water vapour

Water vapour is part of the air around us.

To make it visible:

Fill a dry glass with ice cubes and water and leave it for 15 minutes.
After 15 minutes look at the outside of the glass.
What do you see?
Run your finger over the surface. What do you feel?
What might happen if you empty the glass and let it stand?

Write about your observations:

Observing evaporation

Use a watering can or water bottle to pour a puddle in a sunny spot on a path. Draw a line around the edges of the puddle.

Every hour go outside and draw another line around the edges of the puddle.

Is the line in the same spot as the previous one you drew? What's different?

How long did it take for the puddle to disappear?

Where has the water gone?

Water usage

Make a list of the ways in which humans use water.
Compare yours with the list on **https://www.kidcyber.com.au/water**

Personal water usage

On one day, make a list of the ways you personally use water, noting the time of day: morning, afternoon, evening, during the night. Note quantity of water where you can and time your showers and handwashing.

When you have done this, organise your data as a **timeline** on a larger sheet of paper.

Analyse your timeline and think about ways in which you might save water. See p 19 for some examples of timelines.

A week later, repeat the activity and note any ways you used less water.

Ice - water as a solid

An experiment : Keep an ice cube alive!
Design and make a lidded container for an ice cube and time how long it stays frozen inside your container. Think carefully about the materials you use to make it.

Draw the design here and list materials used to make it:

Guess how long the ice cube will stay frozen in your container _____

Put the ice cube in the container and close the lid. Note the time.

How long did it last? _____

What were the factors that made it last or not?

What observations did you make during the experiment?

An Experiment to test the strength of ice

You will need access to a freezer.

Collect:

- A tin or plastic container ith a lid, but not one that clicks on or fits tightly
- 3 pencils
- A bottle top from a soft drink or water bottle
- Sticky tape.

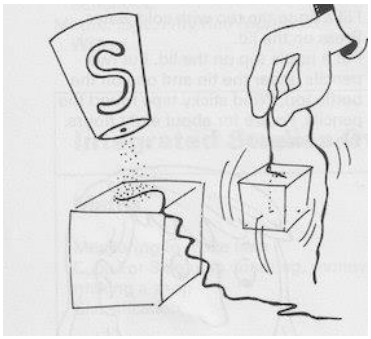
1. Fill the tin or container to the very top with water.
2. Place the lid on top.
3. Put the soft drink bottle top on the lid.
4. Stand the tin or container on two of the pencils and place the third on the bottle top.
5. Wind sticky tape tightly around the top pencil and the two bottom ones at each end to hold the top pencil firmly in place.
6. Carefully put the tin or container into the freezer and leave it for at least 8 hours.

After the time was up, what had happened?

Why?

Lift an ice cube without touching it

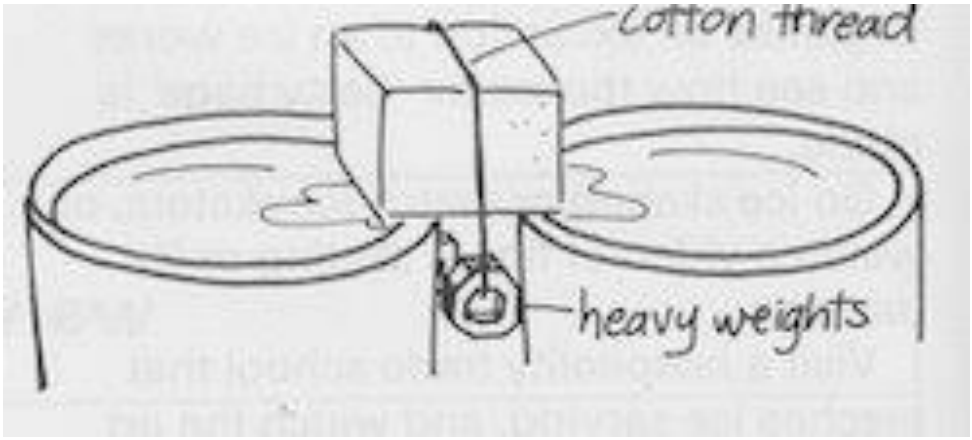
Lay a piece of cotton thread across an ice cube and sprinkle it with salt. Leave for 20 seconds and then pick up the thread to lift the ice cube. Why does this happen?



To find out how salt melts ice, watch a demonstration on **https://www.youtube.com/watch?v=n4OR6MneDn0** You can try this yourself.

Cutting ice with cotton thread

Rest an ice cube across two containers as shown.
Lay some cotton thread across the ice cube.
Attach a weight such as a metal nut to each end of the cotton thread.
Time how long it takes for the thread to cut halfway through the ice cube.
Does the thread cut all the way through before the ice melts?



Why does it happen? Watch a much bigger block of ice being cut:
https://www.youtube.com/watch?v=qQCVnjGUv24

Surface Tension

Water particles sticking together make a thin ‘skin’ called surface tension.

Surface tension is not very strong. It will only support very light objects. Objects that sit on top of the surface skin are not floating because they stay dry. Objects that float get wet.

The surface skin of a drop of water holds al the particles together. Surface tension is the reason why water drops are so small, because when a water drop gets too big the skin breaks. This is seen when a tap is dripping: a water drop forms and grows bigger. When it gets too big and heavy, the surface tension breaks and the water falls.

Because of surface tension, a container can be filled with water to just above the rim. The surface ‘skin’ curves down to the rim and holds the water in. because of surface tension, you can put a pin or paper clip on the surface of water in a cup or glass.

When soap is added to water, it weakens the surface tension. When the surface tension is weaker, it can stretch. This is why you can blow bubbles with soapy water. The surface tension stretches as air is blown into the bubble. When the water evaporates, the bubble bursts.

Some insects appear to walk on water. They are moving across the surface ‘skin’. Many tiny hairs on their legs help spread their weight and prevent them from breaking through the surface tension. Insects such as these are most usually found on freshwater ponds.

The spider is moving across the surface of the water without breaking surface tension. It stays dry.

The rowboat is too heavy and breaks the surface tension. It is floating in the water. It gets wet.

Exploring surface tension: float a paper clip

You need:

- A bowl of water
- Paper towel
- Paper clips

Drop a paper clip into the water. What happens?

Tear off a piece of paper towel slightly larger than the paper clip and float it on the water. Place a paper clip on the paper towel.
What happens?

Gently place another paper clip on the piece of paper towel. Wait a few seconds. Now what happens?

Why do you think this happened?

Exporing surface tension : bubbles

You need:

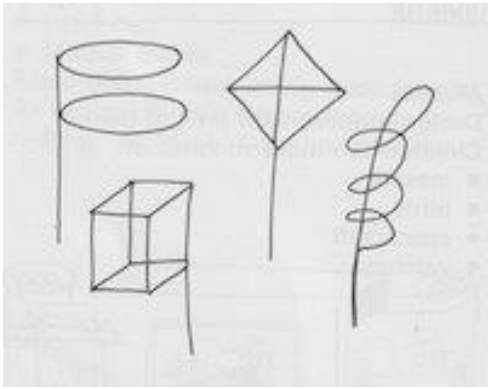
- A clean bucket or large container
- I cup dishwashing liquid
- 10 cups cold tap water (more on a hot dry day)
- A tray or shallow baking pan
- Optional 3-4 tablespoons of liquid glycerin (from a chemist)
- Bubble blowing items

Make the bubble soloution: measure water into bucket and slowly add detergent. Add glycerin for longer lasting bubbles. Stir it all together *slowly* so it doesn't froth. For best results, leave the mixture until the next day. It will keep several weeks in an airtight container.

1. Take 2 drinking straws and a piece of string 5 times longer than the straw. Thread the 2 straws onto the string and knot the ends together. Hold the straws and dip the wand into the bubble solution. Fully open out the string loop and carefully lift it out of the solution. As you pull it towards you, slowly flip the loop up or down to release the bubble.

2. Bend a wire coat hanger into a circle, with the hook as a handle. Dip the circle into the solution. Wave the circle gently through the air and rotate it to complete the bubble.

3. Experiment and make your own blowers. You can bend soft wire into different shapes, but they must be closed in order to blow bubbles. You can try kitchen utensils such as a potato masher.



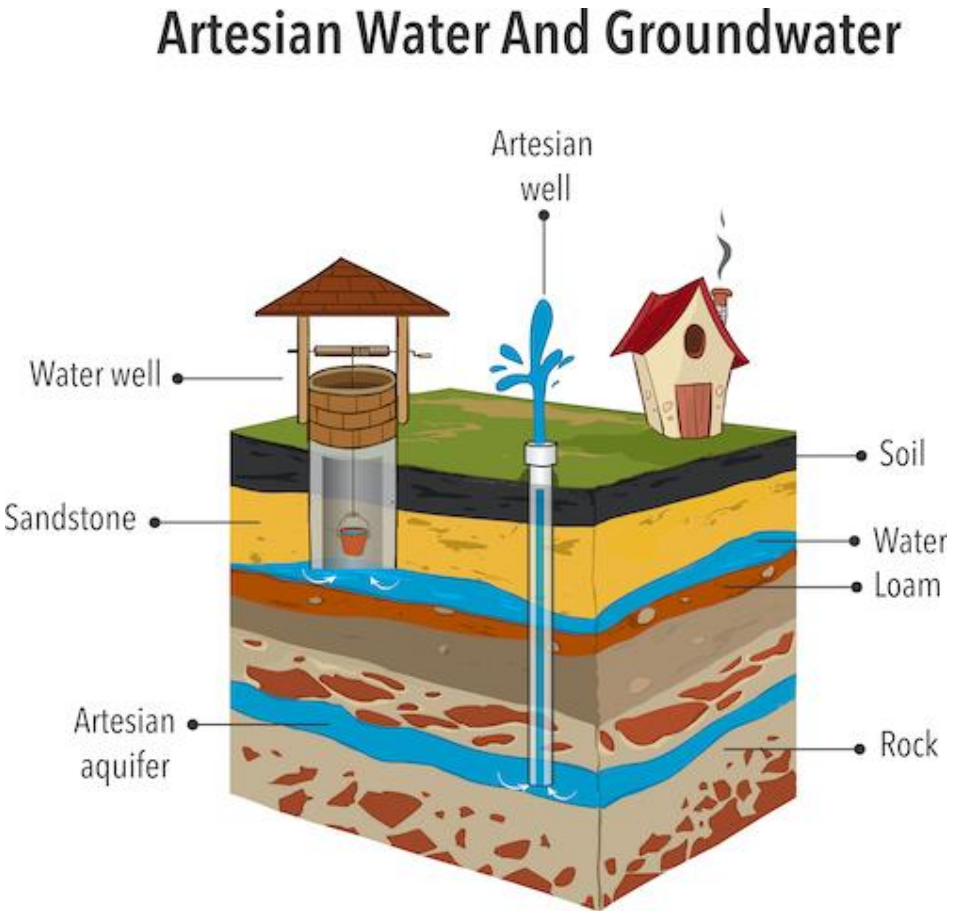
Write some observations about each, noting how different the bubbles were, how long lasting, which made the best bubbles.
Draw the ones you made.

Groundwater

Groundwater is fresh water that is found underground in spaces and cracks between soil, sand and rocks. The top part of the earth that contains underground water is called the **water table**. The soil above the water table also contains water which feeds the plants, but is not completely saturated with water.

Deeper underground, groundwater collects in layers of rock or gravel. This store of water is called an **aquifer**. The water from an aquifer comes to the Earth's surface through springs. Wells can be drilled into aquifers and the water pumped to the surface.

Sometimes part of an aquifer can become enclosed in between hard rocks that lock the water in. This is called a **confined aquifer**. If a well is drilled into a confined aquifer, the water can be released with enough force to push the water up the well to the surface without the need of a pump. This kind of well is called an **artesian well**.



Make an aquifer in a cup

In nature, aquifers consist of layers of sand, gravel and rock.

You will need:

- 2 clear cups
- A jug of water and sand
- Gravel and aquarium rock

1. Fill 2 cups to about ¾ full with layers of sand and gravel.

2. Pour water slowly into one of the cups. Watch how the water fills the spaces between the particles of sand and gravel.

3. Continue to fill this cup to the top – above the top of the sand and gravel. The water above the gravel is called surface water. The water below the gravel is called groundwater.

4. Slowly pour water into the second cup until it reaches about 3 cm below the the top of the sand and gravel. This line is called the water table. Water below the water line is called the saturation zone.

   Does the water seem to move faster through the sand or faster through the gravel?
   Why?

5. Put some food dye on top of the gravel. Sprinkle water like rain onto the gravel and watch how pollution gets into the groundwater.

6. Make a labelled drawing of your two cups. Write some sentences about how groundwater can become contaminated.

Design, build and test a boat that will float

Draw a design for a boat. Draw it here:

Use any variety of materials to construct your design.
Test your boat ina sink or tub.

Did it float well? _____

If not, add some modifications to improve it, or even build a different design. Draw the modifications or the new design.

Test again.
Did it float well?

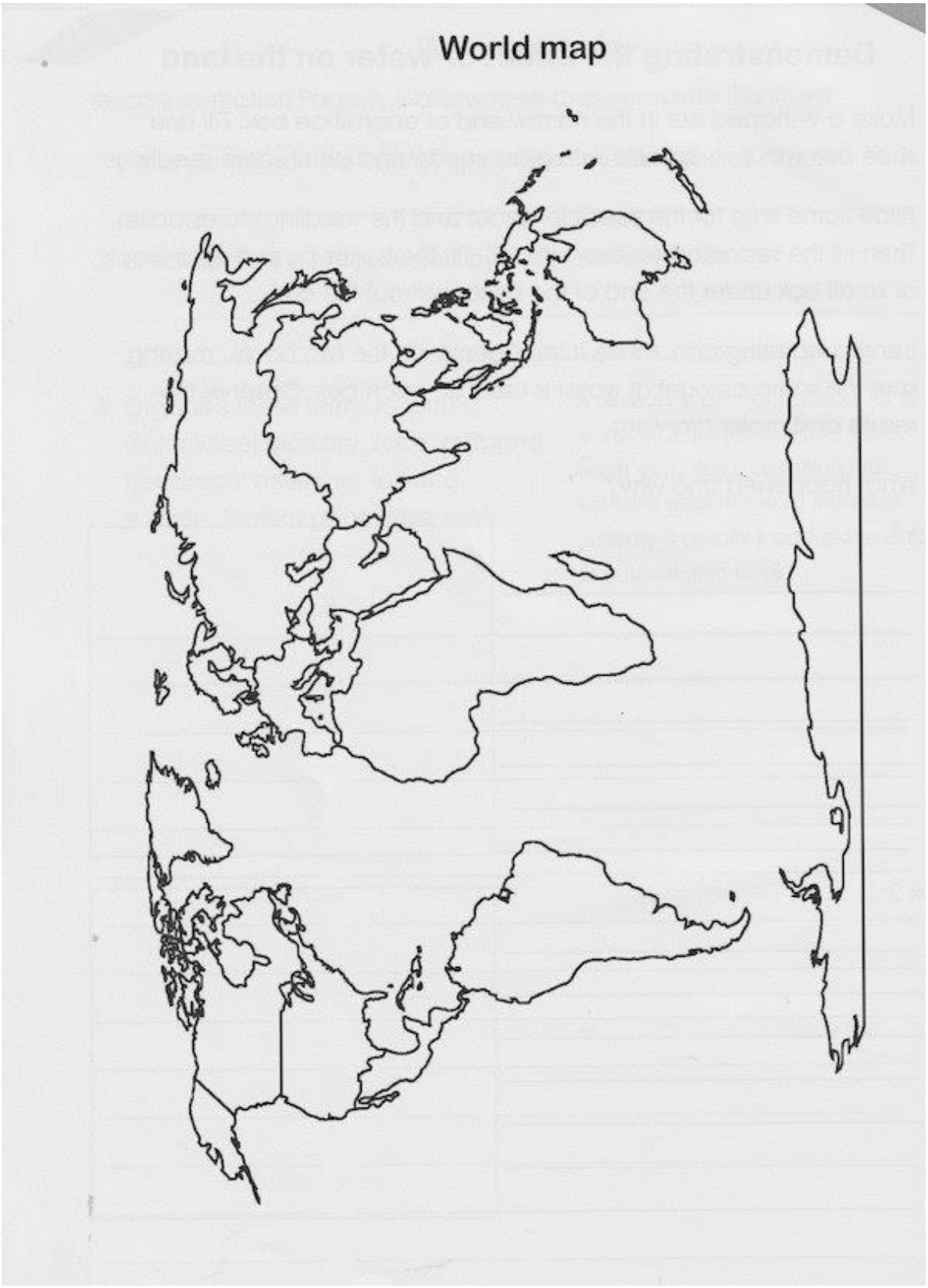
Note your observations:

What did you use to keep the boat level on the water (that is, to keep an even keel)?

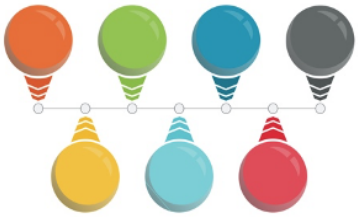
How do you rate your boat? Floated well • floated OK • sank

Why did you give your boat got that rating?

World map



Timelines



A timeline is a way of showing a list of events in the order in which they happened.

It generally reads from left to right.

In these few examples, there would be numbers or dates added, with some information.

Choose one of these examples, or find another example to use, or design your own.

Give your timeline a title.

Ideas for further research

•FACTS ABOUT THE OCEAN
https://www.kidcyber.com.au/oceans

•TIDES
https://kids.kiddle.co/Tide
https://www.youtube.com/watch?v=m8UGm-dKAoE

•WHAT ARE MARINE MAMMALS?
See them listed here:
https://feiromarinelifecenter.org/marine-mammals/
https://oceana.org/marine-life/marine-mammals

Information about many of them can be found in the kidcyber Animals index at **https://www.kidcyber.com.au/animals**

•ANIMALS THAT LIVE IN WATER
https://www.kidcyber.com.au/what-lives-in-water

Check out the kidcyber Animals index for axolotls, fish, jellyfish, coral polyps, molluscs, sea slugs, sharks, squid and other aquatic animals.

•YOU CAN ALSO DO A WEBQUEST ABOUT MARINE ANIMALS:

https://www.kidcyber.com.au/kidcyber-webquest-marine-animals